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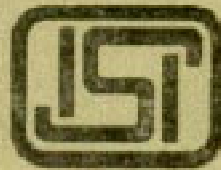
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Indian Standard
METHODS OF MEASUREMENTS ON
PHOTOSENSITIVE DEVICES

PART II PHOTOTUBES

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Indian Standard

METHODS OF MEASUREMENTS ON PHOTOSENSITIVE DEVICES

PART II PHOTOTUBES

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Indian Standard
**METHODS OF MEASUREMENTS ON
PHOTOSENSITIVE DEVICES**
PART II PHOTOTUBES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 11 December 1974, after the draft finalized by the Electron Tubes Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 In preparing this standard, assistance has been derived from IEC Pub 306-2(1969) 'Measurement of photosensitive devices, Part 2 Methods of measurement of phototubes', issued by the International Electrotechnical Commission.

0.3 This is one among a series of Indian Standards on photosensitive devices. Other standards so far published are given on P 6.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part II) deals with the methods of measurements of the following types of phototubes:

- a) Vacuum phototubes, and
- b) Gas-filled phototubes.

NOTE — Photomultipliers are not included in this standard but covered in IS : 7146 (Part IV)-1974†.

*Rules for rounding off numerical values (revised).

†Methods of measurements on photosensitive devices: Part IV Photomultipliers.

IS : 7146 (Part II)-1974

2. TERMINOLOGY

2.1 For the purposes of this standard, the term and definition covered in IS : 1885 (Part IV/Sec 8)-1973* shall apply.

3. MEASURING METHODS

3.0 The measurements should be made under the general conditions described in **3.1** of IS : 7146 (Part I)-1973†.

3.1 Sensitivity — The anode and other electrodes shall be connected as stated and a specified voltage shall be applied between the anode and the cathode. It shall be ensured that the incident radiation covers the specified area of the photocathode.

3.1.1 Radiant Sensitivity — The radiant sensitivity is calculated from the measurement of the photocurrent for the specified radiant flux (or irradiance) incident on the photocathode and shall be presented in amperes per watt (or per watt/square metre).

3.1.2 Luminous Sensitivity — The luminous sensitivity is calculated from the measurement of the photocurrent for the specified luminous flux (or illuminance) incident on the photocathode and shall be presented in amperes per lumen (or per lux).

3.1.3 Dynamic Sensitivity

3.1.3.1 For this measurement, the specified radiation shall be amplitude modulated. For gasfilled phototubes sinusoidal modulation is generally used. For vacuum phototubes, square wave modulation is generally used (to ensure a wide band spectrum).

3.1.3.2 The peak-to-peak modulation amplitude should be approaching 100 percent. The phototube shall be operated under the specified conditions. The dynamic sensitivity is obtained from the measurement of the peak-to-peak photocurrent at the specified modulation frequency and should be presented in amperes per watt.

3.1.3.3 The frequency response of any amplifier used in the measurement shall be flat over the required frequency range.

3.1.4 Relative Spectral Sensitivity — For this measurement, a monochromator or other equivalent instrument shall be used as a radiation source. The sensitivity of the phototube to incident monochromatic light of the different wavelengths over the specified range is measured using the apparatus described in **4.5** of IS : 7146 (Part I)-1973†. If the resulting absolute sensitivities are referred to the sensitivity at a certain wavelength, the relative spectral sensitivity is obtained. The relative spectral sensitivity characteristic

*Electrotechnical vocabulary : Part IV Electron tubes; Section 8 Photosensitive devices.

†Measurements of photosensitive devices : Part I Basic considerations.

shall be presented as a curve giving the sensitivity for each wavelength as a percentage of the maximum value.

NOTE — Values of the relative spectral sensitivity can be taken without restrictions only if the photocurrent is proportional to the incident radiation.

3.2 Gas Amplification Factor of Gasfilled Phototubes — The photocurrent of the gasfilled phototube shall be measured at the specified high and low anode voltages, with the specified load resistance and with the specified luminous flux incident on the photocathode.

NOTE — It is essential that the lower of the two voltages represents the sensitivity without gas amplification, that is, it shall be a voltage close to, but slightly below, the ionization potential of the gas.

3.2.1 The gas amplification factor is the ratio between the larger current and the smaller current.

3.3 Saturation Factor of Vacuum Phototubes — The photocurrent of the vacuum phototube shall be measured at the specified high and low anode voltages, with the specified load resistance and with the specified luminous flux incident on the photocathode.

The saturation factor is the ratio between the smaller current and the larger current.

3.4 Dark Current — The specified voltage shall be applied to each electrode of the phototube, at the specified ambient temperature, in the absence of such radiant energy as is normally used to excite the tube. The anode current is then measured.

NOTE — The socket leakage current shall be substantially lower than the specified dark current.

3.5 Audio Frequency Noise — Under consideration.

3.6 Breakdown — With the tube operating under stated conditions (of supply voltage, limiting resistance, rate of increase of supply voltage and luminous flux) for a stated time it shall be checked whether breakdown occurs.

3.7 Direct Interelectrode Capacitance — This measurement shall be done in accordance with 7 of IS: 4147-1967*.

3.8 Frequency Response — Dynamic sensitivity shall be measured, according to 3.1.3, as a function of modulating frequency. The result may be presented either as a graph or as the ratio, expressed in decibels, of the dynamic sensitivities at two frequencies.

*Method of measurements on conventional receiving electron tubes.

INDIAN STANDARDS

ON

PHOTOSENSITIVE DEVICES

IS:

- 1885 (Part IV/Sec 8)-1973 Electrotechnical vocabulary: Part IV Electron tubes; Section 8 Photosensitive devices
- 7146 (Part I)-1973 Methods of measurements on photosensitive devices: Part I Basic considerations
- 7146 (Part II)-1974 Methods of measurements on photosensitive devices: Part II Phototubes
- 7146 (Part III)-1974 Methods of measurements of photosensitive devices: Part III Photoconductive cells for use in the visible spectrum
- 7146 (Part IV)-1974 Methods of measurements on photosensitive devices: Part IV Photomultipliers